

REMARKS

Claims 1, 3-11 and 24-29 are pending and under active consideration. Claims 1, 3, 6, 7, 9-11, 34, 26, 28 and 29 were rejected under 35 U.S.C. §102(c) over Shimizu (U.S. Publication No. 2002/0004287). Claim 4 was rejected under 35 U.S.C. §103(a) over Shimizu and Figures 1A-1C of the present specification. Claims 5 and 27 were rejected under 35 U.S.C. §103(a) over Shimizu and Spencer (U.S. Patent No. 6,060,019) and claim 8 was rejected under 35 U.S.C. §103(a) over Shimizu and Lee (U.S. Publication No. 2003/0104704).

The claimed method is not anticipated or obvious over Shimizu alone or in combination with the other cited references because Shimizu does not teach or suggest all the recitations of the claimed method. Specifically, the cited references do not teach or suggest a step of removing a portion of the cap layer and the sacrificial layer proximate to the bottom surface of the via, wherein the removed portions of the cap layer and the sacrificial layer deposit predominantly along the lower sidewalls of the via.

The rejection of claims 1, 3, 6, 7, 9-11, 24, 26, 28 and 29 under 35 U.S.C. §102(c) over Shimizu is respectfully traversed.

The claimed method involves providing an interconnect copper line in a dielectric trench, wherein the interconnect copper line is in contact with a cap layer; depositing a sacrificial layer on the cap layer; depositing an interlayer dielectric on the sacrificial layer; forming a trench and a via in the interlayer dielectric, wherein the via bottom extends to the sacrificial layer; and removing a portion of the cap layer and the sacrificial layer proximate to the bottom surface of the via, wherein the removed portions of the cap layer and the sacrificial layer deposit predominantly along the lower sidewalls of the via. Shimizu does not teach or suggest removing a portion of the cap layer and the sacrificial layer proximate to the bottom surface of the via, wherein the removed portions of the cap layer and the sacrificial layer deposit predominantly along the lower sidewalls of the via.

Shimizu describes a semiconductor device containing a first insulating film formed on a semiconductor substrate, a second insulating film consisting of insulating metal nitride formed

on the first insulating film with a recess formed through the second film and reaching a position deeper than an upper surface of the first film and a conductive member filled in the recess. The Office cites Figures 3 and 4 of Shimizu as providing the same structure as obtained by the claimed method. The Office submits that layer 15 in Figure 4 corresponds to the cap layer of the claimed method, that layer 35 in Figure 4 corresponds to the sacrificial layer of the claimed method, that layer 12a in Figure 4 corresponds to the interconnect copper line of the claimed method and that layer 16 in Figure 4 corresponds to the interlayer dielectric layer of the claimed method.

Applicants note that, in Shimizu, the proposed sacrificial layer (35 in Figure 4) is deposited before the proposed cap layer placing it beneath the proposed cap layer (15 in Figure 4). This process is different from the claimed method which has the sacrificial layer deposited after the cap layer placing it on the cap layer (see Figure 3a layers 312 and 313 of the specification). For this reason alone, the claimed method would not have been anticipated by Shimizu.

In addition, the Office states that “[t]he removed portions of the cap layer (15) and the sacrificial layer (35) deposit predominately along the lower sidewalls of the via.” Applicants submit that the Figures in Shimizu and the written description do not teach or suggest this method step. While Shimizu describes removing various layers, Shimizu does not teach or suggest redepositing these layers (15 and 35) along the lower sidewalls of a via. Applicants believe that the Office is incorrect in concluding that this method step is described in Shimizu.

Therefore, the claimed method would not have been anticipated or obvious over Shimizu because Shimizu does not teach or suggest all the recitations of the claimed method. Accordingly, Applicants respectfully request that the Office withdraw the rejection under 35 U.S.C. §102(e) over Shimizu.

Applicants submit that references Spencer and Lee and Figures 1A-1C of the specification fail to overcome the deficiencies of Shimizu, and therefore, the combination of

Shimizu with these references does not render the claimed method obvious. Accordingly, Applicants respectfully request that the Office withdraw the rejections under 35 U.S.C. §103(a).

In light of the remarks contained herein, Applicants submit that the application is in condition for allowance. Favorable reconsideration is respectfully requested.

Applicants have included fees for a one month extension of time and believe no additional fees are due with this response. However, if any additional fees are due, please charge our Deposit Account No. 05-0510, under Order No. 20140-00314-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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